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INFLUENCE OF BREEDTYPE ON ADRENAL RESPONSIVENESS TO ACTH IN BEEF STEERS

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Background: Exposure to stressors may diminish efficiency of beef production by suppressing the immune system and/or growth performance of calves. In prior studies we noted that *Bos indicus* and *Bos taurus* breedtypes differed in size and function of specific endocrine glands that respond to stressors. The anterior pituitary gland secretes adrenocorticotropin (ACTH), which stimulates cortisol secretion from the cortex of the adrenal gland. In this study we measured plasma concentrations of cortisol in Angus, Brahman, Bonsmara, and BonsmaraXAngus crossbred steers. Jugular vein cannulas were placed in each steer the day prior to blood collection. Steers were placed in stanchions to facilitate blood collection procedures. Plasma concentrations of cortisol before and after challenge with ACTH (0.1 IU/kg BW) were determined to compare adrenal responsiveness of the various breedtypes.

Research Findings: Figure 1 and Table 1 summarize plasma concentrations of cortisol prior to and after injection of ACTH. During the period prior to ACTH injection plasma concentrations of CS were lower in Bonsmara steers relative to that observed for the Brahman, Bonsmara X Angus, or Angus steers. At "Time Zero" Bonsmara steers had very low cortisol concentrations, whereas Brahman, Bonsmara X Angus and Angus steers had significantly higher concentrations. Neither the amount of time required to attain peak cortisol, nor the amplitude of the peak cortisol response differed among breeds. The time required for plasma cortisol concentrations to return to mean pre-ACTH concentrations was shortest in the Brahman steers, and longest in the Bonsmara animals, with Bonsmara X Angus, and Angus steers returning to normal concentrations in an intermediate time frame. The Bonsmara steers had substantially lower plasma concentrations of cortisol than the Bonsmara X Angus, Brahman, or the Angus steers during the latter part of the post-ACTH period.

Application: Continued research into factors influencing adrenal function in cattle may lead to effective use of germplasm from tropically adapted Sanga-influenced breeds. Such information may lead to more effective methods of combating the negative effects of stressors; thereby optimizing animal health to enhance profitability.

Table 1: Plasma concentration of cortisol prior to and after injection of ACTH in steers.

Breedtype	Pre-ACTH Period (ng/ml)	Time-0 (ng/ml)	Amplitude of Peak (ng/ml)	Post-Peak Period (ng/ml)
Bonsmara	7.0 ± 5.6 ^{b,d}	1.9 ± 4.4 ^b	34.8 ± 7.0	2.9 ± 3.1 ^b
Brahman	21.7 ± 5.6 ^c	15.2 ± 4.4 ^a	21.7 ± 7.0	14.5 ± 3.1 ^a
BonsXAngus	28.0 ± 5.6 ^a	16.4 ± 4.4 ^a	32.2 ± 7.0	11.1 ± 3.1
Angus	33.1 ± 5.6 ^a	18.8 ± 4.4 ^a	33.7 ± 7.0	15.0 ± 3.1 ^a

Means within columns bearing a, b superscripts differ (P<0.05).

Means within columns bearing c, d superscripts differ (P<0.08).

Figure 1: Plasma concentrations of cortisol prior to and after injection of ACTH (Time 0)

